REMARKS

This response is submitted in reply to the Office Action dated July 17, 2007, issued in connection with the above-identified application. Claims 1, 3-9 and 11-18 are pending in the patent application, with Claims 4-8 and 12-16 being withdrawn. In the non-final Office Action, Claims 1, 3, 9 11, 17, and 18 are rejected under 35 U.S.C. §103. In response, Applicants have amended claims 1 and 9 to incorporate claims 17 and 18, respectively. In view of the amendments and for the reasons set forth below, Applicants respectfully disagree and traverse this rejection. The commissioner is hereby authorized to charge deposit account 02-1818 for any fees which are due and owing.

Applicants acknowledge and thank the Examiner for the telephone conference on October 31, 2007.

Claims 1, 3, 9, 11, 17, and 18 have been rejected under 35 U.S.C. §103(a) as allegedly unpatentable over U.S. Patent No. 6,632,566 ("Yamada") in view of U.S. Patent No. 6,455,202 ("Marugan") and/or in view of U.S. Patent No. 5,631,100 ("Yoshino").

The claimed invention contains two independent claims. Claim 1 recites a cathode comprising a cathode mixture layer including a cathode active material and a binder, the binder includes a styrene butadiene (SBR) latex adhesive and a thickener; wherein the content of the SBR latex adhesive in the cathode mixture layer ranges from 2 to 4 weight percent, the content of the thickener ranges from 0.5 to 2.5 weight percent, the thickener is polyacrylic acid, and the cathode active material includes a lithium iron phosphorous oxide that has an olivine structure. Claim 9 recites a battery comprising a cathode, an anode, and an electrolyte, wherein the cathode is described as in claim 1. Applicants respectfully assert that the cited references cannot be combined to disclose all the elements of claims 1 and 9, and question whether the cited references, even if properly combinable, provide sufficient description to cover the claimed invention.

As the Examiner alleged in the previous office action, Yamada describes the lithium iron phosphate material as claimed as the cathode active material, but does not explicitly teach a binder comprising a rubber latex and a thickener. In order to provide the thickener and the rubber latex, Yamada was combined with either Marugan or Yoshino, but Applicants respectfully assert that neither of these references, even if properly combinable, would lead one skilled in the art to modify Yamada to cover the claimed invention.

With regard to Marugan, the rejection for obviousness is moot due to the amendments to the claims. As proposed in the telephone conference, Applicants have incorporated claim 17 into claim 1, and claim 18 into claim 9, thereby further requiring polyacrylic acid as a thickener with the SBR latex material. At a minimum, this amendment overcomes the rejection in view of Marugan because there is no teaching or suggestion to use SBR latex in 2 to 4 weight percent and polyacrylic acid in 0.5 to 2.5 weight percent of the cathode mixture layer.

With regard to Yoshino, the Applicants continue to assert that the reference, even if properly combinable, would not lead one of ordinary skill to modify the primary reference to cover the claimed invention, and therefore respectfully traverse the rejection. For example, the reference broadly describes the use of binders on either electrode. The amount of binder is generally 0.1 to 20 parts by weight per 100 parts by weight of electrode active material, preferably 0.5 to 10 parts by weight. SBR latex can be a binder. However, as discussed in the telephone conference, nowhere in the specification does the reference teach using SBR latex on the cathode. SBR latex on the anode is described in detail starting at column 8, line 24. In the 30 examples used to enable the reference, Examples 17 to 30 describe SBR latex on the anode using needle coke as the anode active material, but Examples 1 to 16 only use fluororubber for cathode preparation, not SBR latex. (Col. 12 ln 49 thru Col. 18 ln 40.)

As the Examiner has noted in her summary of the telephone conference, the combination of claims 1 and 3 in Yoshino might lead one of ordinary skill to contemplate SBR latex at the cathode, but claim 1 indicates the use of any binder on at least one of the positive or negative electrodes. The claim contains no information on what amounts to use, and which electrode to prepare. One of ordinary skill would look at the claim, and may consider using SBR latex on the cathode. However, when looking to the specification to determine what actually would work, one of ordinary skill would note that SBR is only described on the anode, and that fluororubber is only described on the cathode. Furthermore, the amount of binder relative to the electrode active material would also lead one of ordinary skill to a much larger range than presented in the invention as presently claimed.

In contrast, Applicants have surprisingly discovered that SBR latex, not a fluoropolymer, in a discrete range of 2 to 4 weight percent, in combination with polyacrylic acid at 0.5 to 2 weight percent, and using $LiFePO_4$ with an olivine structure as cathode active material, provides for a highly improved cathode. The Examples support this surprising discovery. (Pages 13-19,

and tables 1,2 and 3 specifically.) Turning to Table 1, Example 1-1, having 2 weight percent SBR and 1 weigh percent polyacrylic acid, and Example 1-2, having 4 weight percent SBR and 1 weigh percent polyacrylic acid, give positive peel strength results (effectively binding force). However, Comparative examples 1-1, with 1 weight percent SBR and 1 weigh percent polyacrylic acid, and Comparative example 1-2, with 5 weight percent SBR and 1 weigh percent polyacrylic acid, give poor peel strength results. Note that Yoshino specifically contemplates using Comparative examples 1-1 and 1-2 in its preferred embodiment of a binder amount of 0.5 to 10 parts per 100 parts by weight of electrode active material. See also Table 2 for similar conclusions. Furthermore, comparative examples 1-3 and 1-4, using the fluoropolymer PVDF, effectively the parallel of examples 1-16 in Yoshino, also fail the peel strength test. Therefore Yoshino actually teaches away from the claimed invention because it indicates a preferred range and a binder that the Applicants have determined would in fact fail.

This assertion is further buttressed by charge and discharge cycle tests in Examples 3-1 and 3-2 of a 2 weight percent SBR and 1 weigh percent polyacrylic acid, as compared to an alternative binder, fluoropolymer PVDF, at 6% weight. Again, Applicants submit that Yoshino teaches the use of a fluoropolymer as a binder at the cathode in Examples 1-16, a result that in facts fails to meet the surprising improvement in the Applicants' invention.

Finally, Applicants continue to question whether Yoshino art can even be combined with Yamada. Yamada is primarily relied on for its alleged teaching regarding a positive electrode containing a lithium phosphorous oxide. In contrast, Yoshino is directed to cathode active materials without phosphorous, such as lithium cobalt oxides and lithium manganese oxides. Yamada focuses on cathode active materials that provide improved cycle characteristics. Yoshino focuses on solving performance problems by selecting binders, solvents for coating, viscosities of the coating solution, and drying methods and temperatures in order to achieve a specific "binder distribution coefficient." Col. 4 ln 12 to col 5 ln 25; Examples 1-30. While both focus the general area of battery construction, the methods for solving the problem associated with each are only distantly related. Therefore, Applicants believe that improper hindsight construction is required in order to combine the two references to construct a cathode with $LiFePO_4$ in an olivine structure, with 2 to 4 weight percent SBR latex, and 0.5 to 2 weight percent polyacrylic acid.

Accordingly, Applicants respectfully request that the obviousness rejection be withdrawn.

For the foregoing reasons, Applicants respectfully submit that the present application is in condition for allowance and earnestly solicit reconsideration of same.

Respectfully submitted,

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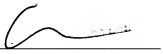
BY 

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